~~Patent Claims~~ WHAT IS CLAIM IS:

1. A method for etching a silicon layered body having a first silicon layer (15) which is provided with an etching mask (10) for defining lateral recesses (21), work being carried out in a first etching process with a plasma, and trenches (21') being formed by anisotropic etching in the region of the lateral recesses (21), characterized in that, buried between the first silicon layer (15) and a further silicon layer (17, 17') is at least one separating layer (12, 14, 14', 16), upon reaching which, the first etching process comes at least almost to a standstill; that the separating layer (12, 14, 14', 16) is thereupon etched through in an exposed region (23, 23') by a second etching process; and that a third etching process subsequently etches the further silicon layer (17, 17').

2. The method as recited in Claim 1, characterized in that a complete isotropic undercutting is produced between at least two trenches (21') by the third etching process in such a way that a free-standing structure (32) is formed.

3. The method as recited in Claim 1, characterized in that the first etching process is a dry etching process in which deposition steps are carried out alternating with generally known isotropic etching steps, a deposition gas, preferably octafluorocyclobutane C_4F_8 or perfluoropropylene C_3F_6, supplying polymer-forming monomers being exposed during the deposition steps to a highly dense plasma, particularly a PIE plasma (propagation ion etching) or an ICP plasma (inductively coupled plasma) which builds up a Teflon-like film 20 of $(CF_2)_n$ on the side walls of the trenches (21'); and in that an etchant gas, in particular sulfur hexafluoride SF_6 supplying fluorine radicals, with admixed oxygen, is used

during the etching processes.

4. The method as recited in Claim 1, characterized in that the first, anisotropic etching process of the trenches (21') exhibits a high selectivity with respect to silicon dioxide.

5. The method as recited in Claim 1, characterized in that the separating layer (12, 14, 14', 16) is formed from at least a first separating-layer section (12) and a second separating-layer section (16), the first separating-layer section (12) containing silicon dioxide, another silicon oxide, silicon nitride, glass, a ceramic or a mixture thereof, and being deposited using deposition methods known from semiconductor technology, and the second separating-layer section (16) preferably being a silicon dioxide layer.

6. The method as recited in Claim 1, characterized in that the second etching process for etching through the separating layer (12, 14, 14', 16) in the exposed region (23, 23') of the trenches (21') is carried out using a dry chemical treatment, preferably with the aid of plasma etching.

7. The method as recited in Claim 6, characterized in that the plasma etching is carried out under strong ion bombardment and with the aid of an etchant gas, preferably CF_4, C_2F_6, C_3F_8, CHF_3, C_3F_6 or C_4F_8.

8. The method as recited in Claim 1, characterized in that the second etching process for etching through the separating layer (12, 14, 14', 16) in the exposed region (23, 23') of the trenches (21') is carried out with a wet chemical treatment, and particularly with the aid of diluted hydrofluoric acid or hydrofluoric acid solutions.

9. The method as recited in Claim 1, characterized in that the exposed structures (32) have a bottom (30) which is at least largely free of an etch attack during etching, particularly during the undercutting in the third etching process.

10. The method as recited in Claim 1, characterized in that, prior to or during the third etching process, the side walls of the trenches (21'), prior to the undercutting, are selectively coated with a plasma polymer for producing a Teflon-like film (20).

11. The method as recited in Claim 5, characterized in that, applied on the further silicon layer (17) is the first separating-layer section (12), upon which a conducting layer (13) is then deposited, at least region-wise, and optionally patterned, the conducting layer being made preferably of conductive, highly doped polysilicon; and that the second separating-layer section (16) is thereupon deposited onto the conducting layer (13).

12. The method as recited in Claim 11, characterized in that the first and second separating-layer sections (12, 16) are deposited in such a way that the conducting layer (13) is completely enclosed.

13. The method as recited in Claim 5 ~~or 11~~, characterized in that the second separating-layer section (16) is deposited from the vapor phase, in particular by decomposition of silanes.

14. The method as recited in Claim 5 ~~or 11~~, characterized in that the first separating-layer section (12) is formed from thermally grown silicon dioxide.

15. The method as recited in Claim 5,

characterized in that the separating-layer sections (12) and (16) each have a thickness of 500 nm to 50 µm, in particular of 1 µm to 10 µm.

16. The method as recited in Claim 5,
characterized in that the first and/or the second separating-layer section (12, 16) in the vicinity of at least one trench (21') or an exposed structure (32) are thinned by etching back to an etched-back separating-layer section having a thickness of 10 nm to 100 nm, or are completely removed and, instead, a third separating-layer section (14) of less thickness is subsequently grown, preferably from silicon dioxide.

17. The method as recited in Claim 16,
characterized in that the third separating-layer section (14) is produced with a thickness of 10 nm to 100 nm.

18. The method as recited in Claim 16,
characterized in that the first silicon layer (15) is grown on the second separating-layer section (16) and the etched-back separating-layer section, or on the separating-layer section (16) and the grown, third separating-layer section (14).

19. The method as recited in Claim 16, 17 ~~or 18~~,
characterized in that the second separating-layer section (16) is thicker, in particular more than ten times to one thousand times thicker, than the etched-back separating-layer section or the third separating-layer section (14).

20. The method as recited in Claim 1,
characterized in that the first silicon layer (15) is made of epipolysilicon which is optionally doped and/or plated on the surface and/or patterned.

21. The method as recited in Claim 20,
characterized in that the plated surface of the first

silicon layer (15) is an aluminum contact layer which is protected from the attack of fluorine-containing gases by a photoresist mask as etching mask (10).

22. The method as recited in ~~at least one of the preceding claims~~ Claim 1,
characterized in that the depth of the trenches (21') etched in the first etching process is independent of the ratio of width to height of the trenches (21'), and is set on the basis of the etching time for achieving the exposed regions (23, 23') of the first separating-layer section (16), of the grown, third separating-layer section (14) or of the further separating layer (14').

23. The method as recited in Claim 1,
characterized in that all the etching processes are carried out in a single etching chamber, and that in particular, the silicon layered body remains in the etching chamber during the etching processes.

24. The method as recited in Claim 1,
characterized in that the etching mask (10) and the remaining Teflon-like films (20) are finally removed from the etched silicon layered body in an oxygen plasma stripper by an oxygen ashing process.

25. The method as recited in Claim 24,
characterized in that, after the removal of the remaining Teflon-like films, a Teflon-like coating is applied on the side walls of the free-standing structure (32), the side walls of the trenches (21') and all areas shadowed from the normal ionic incidence, in the course of which, electrical contact areas, in particular, remain free from a Teflon-like coating.

26. The method as recited in Claim 18,
characterized in that, prior to growing the first silicon

layer (15) on the grown third separating-layer section (14) or the etched-back separating-layer section, first of all an intermediate layer (17'), which forms the further silicon layer as sacrificial layer, is applied, and that this intermediate layer (17') is subsequently covered with a further separating layer (14'), at least in the exposed regions (23, 23').

27. The method as recited in Claim 26, characterized in that the intermediate layer (17') is grown from silicon, epipolysilicon, polysilicon, or conductive and/or doped polysilicon.

28. The method as recited in Claim 26, characterized in that the further separating layer (14') is produced from thermally grown silicon dioxide.

29. The method as recited in Claim 28, characterized in that the further separating layer (14') has a thickness of 10 nm to 100 nm.

30. The method as recited in ~~at least one of Claims 26 through 29~~ Claim 26, characterized in that, due to a patterning of the further separating layer (14'), the intermediate layer (17') is not completely surrounded by the further separating layer (14') and by a separating-layer section (14, 16).

31. The method as recited in ~~at least one of the preceding claims~~ Claim 26 for producing sensor elements having free-standing structures (32).